

What we claim is:

5 1. A prosthesis comprising a reinforcement element and a prosthetic conduit comprising biocompatible material, the prosthetic conduit having a generally cylindrical section and an expanded section extending from the generally cylindrical section, wherein the reinforcement element at the junction between the generally cylindrical section and the expanded section.

10 2. The prosthesis of claim 1 wherein the biocompatible material comprises tissue.

15 3. The prosthesis of claim 2 wherein the tissue comprises pericardium, submucosa or dura mater.

20 4. The prosthesis of claim 2 wherein the tissue comprises porcine, ovine, equine or bovine tissue.

25 5. The prosthesis of claim 2 wherein the tissue comprises crosslinked tissue.

30 6. The prosthesis of claim 5 wherein the tissue is crosslinked with glutaraldehyde or triglycidylamine.

7. The prosthesis of claim 1 wherein the biocompatible material comprises at least two segments joined to form the conduit.

8. The prosthesis of claim 7 wherein one segment forms the generally cylindrical section and a portion of the expanded section.

9. The prosthesis of claim 1 wherein the biocompatible material comprises a single segment.

10. The prosthesis of claim 1 wherein the expanded section has a maximum diameter at least about 10% larger than the average diameter of the generally cylindrical section.

5 11. The prosthesis of claim 1 wherein the expanded section has a maximum diameter from about 12% to about 20% larger than the average diameter of the generally cylindrical section.

10 12. The prosthesis of claim 1 wherein the expanded section has scallops along its free edge for attachment around a native aortic heart valve.

13. The prosthesis of claim 1 further comprising a prosthetic valve connected to the expanded section.

15 14. The prosthesis of claim 13 wherein the prosthetic valve comprises a rigid leaflet connected to an orifice ring.

15. The prosthesis of claim 13 wherein the prosthetic valve comprises tissue leaflets.

20 16. The prosthesis of claim 13 wherein the prosthetic valve comprises flexible polymer leaflets.

25 17. The prosthesis of claim 1 wherein the expanded section comprises tubules positioned for the attachment of the right and left coronary arteries.

18. The prosthesis of claim 1 wherein the expanded section has two components that connect together to complete the formation of the expanded section.

30 19. The prosthesis of claim 1 wherein the reinforcement element is a ring.

20. The prosthesis of claim 1 wherein the reinforcement element comprises tissue.

5 21. The prosthesis of claim 1 wherein the reinforcement element comprises a polymer.

22. The prosthesis of claim 21 wherein the polymer is woven into a fabric.

10 23. The prosthesis of claim 1 wherein the reinforcement element comprises metal.

24. The prosthesis of claim 1 wherein the reinforcement element is a band of pericardium.

15 25. The prosthesis of claim 1 wherein the reinforcement element is a roll of tissue.

26. The prosthesis of claim 1 wherein the reinforcement element surrounds the circumference of the biocompatible material.

20 27. The prosthesis of claim 1 wherein the reinforcement element surrounds only a portion of the circumference of the biocompatible material.

25 28. The prosthesis of claim 1 wherein the prosthetic conduit has a reinforcement near the inflow edge.

29. The prosthesis of claim 1 wherein the prosthetic conduit has a reinforcement near the outflow edge.

30 30. A prosthesis comprising a biocompatible material formed into a generally cylindrical section and an expanded section extending from the generally cylindrical

section, the expanded section including tubules connecting the central lumen of the expanded section to an external opening.

5 31. The prosthesis of claim 30 wherein the tubules are positioned for the attachment of the right and left coronary arteries.

32. The prosthesis of claim 30 wherein the biocompatible material comprises at least two sections of material that join together to form the generally cylindrical section and the expanded section.

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33. The prosthesis of claim 30 further comprising a prosthetic heart valve.

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34. The prosthesis of claim 33 wherein the prosthetic heart valve is a stentless valve with flexible leaflets and a leaflet support structure that is positioned to avoid blockage of the tubules.

35. The prosthesis of claim 30 wherein the biocompatible material comprises tissue.

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36. A prosthesis comprising biocompatible material formed into a generally cylindrical section and an expanded section connected to the generally cylindrical section to form a conduit with a lumen extending through the generally cylindrical section and the expanded section, the free edge of the expanded section having scallops that fit adjacent to and downstream from the commissures of a native heart valve.

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37. The prosthesis of claim 36 wherein the biocompatible material comprises tissue.

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38. The prosthesis of claim 36 further comprising a prosthetic valve attached to the biocompatible material.

39. A prosthesis comprising a reinforcement element, a prosthetic conduit comprising biocompatible material and a prosthetic valve attached to the prosthetic conduit, wherein the reinforcement element is attached to the prosthetic conduit downstream from the prosthetic valve to inhibit dilation of the conduit and to promote proper valve function.

40. The prosthesis of claim 39 wherein the prosthetic conduit comprises a generally cylindrical section and an expanded section extending from the generally cylindrical section, wherein the reinforcement element is positioned at the junction between the generally cylindrical section and the expanded section.

41. The prosthesis of claim 39 wherein the prosthesis further comprises a reinforcement near the inflow edge.

42. A prosthesis comprising a first prosthetic conduit section and a second prosthetic conduit section wherein the inflow edge of the first prosthetic conduit section is configured for attachment to the outflow edge of the second prosthetic conduit section, the first prosthetic conduit section having a generally cylindrical section and the second prosthetic conduit section comprising a prosthetic valve.

43. The prosthesis of claim 42 wherein the second conduit section has an expanded section having a maximum diameter at least about 10% greater than the average diameter of the generally cylindrical section.

44. The prosthesis of claim 42 wherein the prosthetic valve is a mechanical valve.

45. The prosthesis of claim 44 wherein the second conduit section has an expanded section with a generally spherical shape over a portion of a sphere.

46. The prosthesis of claim 42 wherein the prosthetic valve has flexible leaflets.

47. The prosthesis of claim 46 wherein the second conduit section has an expanded section with three lobes.

48. A prosthesis comprising a reinforcement element and a prosthetic conduit comprising biocompatible material, wherein the reinforcement element is attached to the prosthetic conduit proximate to the outflow edge.

49. The prosthesis of claim 48 further comprising a prosthetic valve attached to the prosthetic conduit.

50. A prosthesis comprising a reinforcement element, a prosthetic conduit comprising biocompatible material and a prosthetic valve attached to the prosthetic conduit, wherein the reinforcement element is attached to the prosthetic conduit proximate to the inflow edge.